

REPORT DOCUMENTATION PAGE**Form Approved**
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Washington Headquarters Service, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington, DC 20503.

PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.

1. REPORT DATE (DD-MM-YYYY) 01-04-2010		2. REPORT TYPE Master of Military Studies Research Paper		3. DATES COVERED (From - To) September 2009 - April 2010	
4. TITLE AND SUBTITLE The genesis of the Soviet Union's failure during the Soviet-Afghan War: How the geographpy of Afghanisatn impacted Soviet operations in the 1980s.				5a. CONTRACT NUMBER N/A	
				5b. GRANT NUMBER N/A	
				5c. PROGRAM ELEMENT NUMBER N/A	
6. AUTHOR(S) Major Paul C. Teachey				5d. PROJECT NUMBER N/A	
				5e. TASK NUMBER N/A	
				5f. WORK UNIT NUMBER N/A	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) USMC Command and Staff College Marine Corps University 2076 South Street Quantico, VA 22134-5068				8. PERFORMING ORGANIZATION REPORT NUMBER N/A	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A				10. SPONSOR/MONITOR'S ACRONYM(S) N/A	
				11. SPONSORING/MONITORING AGENCY REPORT NUMBER N/A	
12. DISTRIBUTION AVAILABILITY STATEMENT Unlimited					
13. SUPPLEMENTARY NOTES N/A					
14. ABSTRACT <p>The geography of Afghanistan presents some of the most severe terrain and weather on the planet. The Hindu Kush Mountains in the northeast region display peaks above 24,000 feet and the desert regions in the southwest will often carry temperatures well above 100 degrees Fahrenheit. During the 1980s, the Soviet's superior equipment, training and technology were severely degraded while engaging the Afghanis in such an austere environment.</p> <p>Although there were political, social and economical factors which caused the Soviets to withdraw in 1989, the catalyst of the Soviet's demise was the extreme environment and topography. This paper attempts to justify this theory by analyzing how the Afghan geography impacted the Soviet's mobility, weapons, logistics, and equipment.</p> <p>The Soviet Army was ultimately defeated by an enemy who knew how to fight in a mountainous environment. The geography not only placed substantial limitations on the Soviet's equipment, but it degraded the performance of their modern equipment as well as challenged their military doctrine. The Mujahideen resistance was firmly grounded on their familiarity and ability to use the rugged terrain.</p>					

INSTRUCTIONS FOR COMPLETING SF 298

15. SUBJECT TERMS

Afghanistan, Soviet-Afghan War, Afghanistan Geography, Soviet Operations

16. SECURITY CLASSIFICATION OF:

a. REPORT

Unclass

b. ABSTRACT

Unclass

c. THIS PAGE

Unclass

17. LIMITATION OF ABSTRACT

UU

18. NUMBER OF PAGES

30

19a. NAME OF RESPONSIBLE PERSON

Marine Corps University / Command and Staff College

19b. TELEPHONE NUMBER (Include area code)

(703) 784-3330 (Admin Office)

INSTRUCTIONS FOR COMPLETING SF 298

1. REPORT DATE. Full publication date, including day, month, if available. Must cite at least the year and be Year 2000 compliant, e.g., 30-06-1998; xx-08-1998; xx-xx-1998.

2. REPORT TYPE. State the type of report, such as final, technical, interim, memorandum, master's thesis, progress, quarterly, research, special, group study, etc.

3. DATES COVERED. Indicate the time during which the work was performed and the report was written, e.g., Jun 1997 - Jun 1998; 1-10 Jun 1996; May - Nov 1998; Nov 1998.

4. TITLE. Enter title and subtitle with volume number and part number, if applicable. On classified documents, enter the title classification in parentheses.

5a. CONTRACT NUMBER. Enter all contract numbers as they appear in the report, e.g. F33615-86-C-5169.

5b. GRANT NUMBER. Enter all grant numbers as they appear in the report, e.g. 1F665702D1257.

5c. PROGRAM ELEMENT NUMBER. Enter all program element numbers as they appear in the report, e.g. AFOSR-82-1234.

5d. PROJECT NUMBER. Enter all project numbers as they appear in the report, e.g. 1F665702D1257; ILIR.

5e. TASK NUMBER. Enter all task numbers as they appear in the report, e.g. 05; RF0330201; T4112.

5f. WORK UNIT NUMBER. Enter all work unit numbers as they appear in the report, e.g. 001; AFAPL30480105.

6. AUTHOR(S). Enter name(s) of person(s) responsible for writing the report, performing the research, or credited with the content of the report. The form of entry is the last name, first name, middle initial, and additional qualifiers separated by commas, e.g. Smith, Richard, Jr.

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES). Self-explanatory.

8. PERFORMING ORGANIZATION REPORT NUMBER. Enter all unique alphanumeric report numbers assigned by the performing organization, e.g. BRL-1234; AFWL-TR-85-4017-Vol-21-PT-2.

9. SPONSORING/MONITORS AGENCY NAME(S) AND ADDRESS(ES). Enter the name and address of the organization(s) financially responsible for and monitoring the work.

10. SPONSOR/MONITOR'S ACRONYM(S). Enter, if available, e.g. BRL, ARDEC, NADC.

11. SPONSOR/MONITOR'S REPORT NUMBER(S). Enter report number as assigned by the sponsoring/ monitoring agency, if available, e.g. BRL-TR-829; -215.

12. DISTRIBUTION/AVAILABILITY STATEMENT. Use agency-mandated availability statements to indicate the public availability or distribution limitations of the report. If additional limitations/restrictions or special markings are indicated, follow agency authorization procedures, e.g. RD/FRD, PROPIN, ITAR, etc. Include copyright information.

13. SUPPLEMENTARY NOTES. Enter information not included elsewhere such as: prepared in cooperation with; translation of; report supersedes; old edition number, etc.

14. ABSTRACT. A brief (approximately 200 words) factual summary of the most significant information.

15. SUBJECT TERMS. Key words or phrases identifying major concepts in the report.

16. SECURITY CLASSIFICATION. Enter security classification in accordance with security classification regulations, e.g. U, C, S, etc. If this form contains classified information, stamp classification level on the top and bottom of this page.

INSTRUCTIONS FOR COMPLETING SF 298

17. LIMITATION OF ABSTRACT. This block must be completed to assign a distribution limitation to the abstract. Enter UU (Unclassified

Unlimited) or SAR (Same as Report). An entry in this block is necessary if the abstract is to be limited.

*United States Marine Corps
Command and Staff College
Marine Corps University
2076 South Street
Marine Corps Combat Development Command
Quantico, Virginia 22134-5068*

MASTER OF MILITARY STUDIES

**THE GENESIS OF THE SOVIET UNION'S FAILURE DURING THE SOVIET-
AFGHAN WAR:
HOW THE GEOGRAPHY OF AFGHANISTAN IMPACTED SOVIET OPERATIONS IN
THE 1980s.**

**SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF MILITARY STUDIES**

Major P. C. Teachey

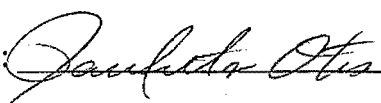
AY 09-10

Mentor and Oral Defense Committee Member: Dr. Edward J. Erickson

Approved: 

Date : 22 March 2010

Oral Defense Committee Member: Dr. Pauletta J. Otis

Approved:  24 March 2010

Date: 22 March 2010

Executive Summary

Title: The genesis of the Soviet Union's failure during the Soviet-Afghan War: How the geography of Afghanistan impacted Soviet operations in the 1980s.

Author: Major Paul Teachey, USMC

Thesis: The mountainous terrain of Afghanistan was the key external factor that prevented the Soviet Army from defeating the Mujahideen.

Discussion: The geography of Afghanistan presents some of the most severe terrain and weather on the planet. The Hindu Kush Mountains in the northeast region display peaks above 24,000 feet and the desert regions in the southwest will often carry temperatures well above 100 degrees Fahrenheit. During the 1980s, the Soviet's superior equipment, training and technology were severely degraded while engaging the Afghanis in such an austere environment.

Although there were political, social and economical factors which caused the Soviets to withdraw in 1989, the catalyst of the Soviet's demise was the extreme environment and topography. This paper attempts to justify this theory by analyzing how the Afghan geography impacted the Soviet's mobility, weapons, logistics, and equipment.

Conclusion: The Soviet Army was ultimately defeated by an enemy who knew how to fight in a mountainous environment. The geography not only placed substantial limitations on the Soviet's equipment, but it degraded the performance of their modern equipment as well as challenged their military doctrine. The Mujahideen resistance was firmly grounded on their familiarity and ability to use the rugged terrain.

DISCLAIMER

THE OPINIONS AND CONCLUSIONS EXPRESSED HEREIN ARE THOSE OF THE INDIVIDUAL STUDENT AUTHOR AND DO NOT NECESSARILY REPRESENT THE VIEWS OF EITHER THE MARINE CORPS COMMAND AND STAFF COLLEGE OR ANY OTHER GOVERNMENT AGENCY. REFERENCES TO THIS STUDY SHOULD INCLUDE THE FORGOING STATEMENT.

QUOTATION FROM, ABSTRACTION FROM, OR REPRODUCTION OF ALL OR ANY PART OF THIS DOCUMENT IS PERMITTED PROVIDED PROPER ACKNOWLEDGEMENT IS MADE.

Acknowledgements

I would like to thank Dr. Edward Erickson, Ph. D., for his advice and guidance while I researched my topic and developed the framework for this paper. I am grateful for his assistance in refining the thesis of this document and for enabling me to focus on the true purpose of my project.

I am also indebted to Lieutenant Colonel Bjornar Lunde, NOR Army, for his leadership and guidance as my military faculty advisor. His advice on the mechanics of writing a research paper was invaluable. LtCol. Lunde provided timely suggestion and research assistance that proved very useful as I narrowed down my research topic.

Table of Contents

	Page
EXECUTIVE SUMMARY	i
DISCLAIMER	ii
ACKNOWLEDGEMENTS	iii
CHAPTER 1 - INTRODUCTION	1
Research Methodology	1
Soviet-Afghan War	2
CHAPTER 2 – AFGHANISTAN’S GEOGRAPHY	3
CHAPTER 3 – ORGANIZATION OF THE MUJAHIDEEN	5
CHAPTER 4 – ORGANIZATION OF THE SOVIET FORTIETH ARMY	7
CHAPTER 5 – ORGANIZATION OF THE DRA ARMY	8
CHAPTER 6 – TERRAIN IMPACT ANALYSIS	9
Maneuver	9
Weaponry	12
Logistics	16
Equipment	20
CHAPTER 7 - CONCLUSION	23
BIBLIOGRAPHY	28
APPENDIX A	29
APPENDIX B	30

CHAPTER 1 – INTRODUCTION

“When the invader pierces deep into the heart of the weaker country and occupies her territory in a cruel and oppressive manner, there is no doubt that conditions of terrain, climate, and society in general offer obstacles to his progress and may be used to advantage by those who oppose him.”

-Mao Tse-tung on Guerrilla Warfare

The geography of Afghanistan presents some of the most severe terrain and weather on the planet. The Hindu Kush Mountains in the northeast region display peaks above 24,000 feet and the desert regions in the southwest will often carry temperatures well above 100 degrees Fahrenheit. Afghanistan’s austere environment as well as its mere location in central Asia has for hundreds of years made it the unassuming buffer between Eurasian Empires and their conquests to the Indian subcontinent. Alexander’s Army journeyed this rugged land during its conquest for India and learned to avoid the Hindu Kush by discovering mountain passes near the Kabul River.¹ Over 2,000 years later, the Soviet Union would learn similar lessons while fighting the Mujahideen. During the 1980s, the Soviet’s superior equipment, training and technology was severely degraded while engaging the Afghans on their home soil. The mountainous terrain of Afghanistan was the key external factor that prevented the Soviet Army from defeating the Mujahideen.

Research Methodology

The intent of this paper is to provide the reader with an understanding of how the geography of Afghanistan was the crucial ingredient that allowed the Mujahideen to survive and forced the Soviet Union to withdraw. The primary research question was how the Afghanistan geography influenced Soviet operations in the 1980’s. The overwhelming conclusion was that the terrain was the key factor that prevented Soviet success. Although there were political, social

and economic factors which caused the Soviets to withdraw in 1989, the catalyst of the Soviet's demise was the extreme environment and topography.

To prove this theory, the research was conducted with the following secondary questions:

1. How did the terrain impact the Soviet army's mobility and maneuver doctrine?
2. How did the terrain influence the employment of weapons and their suitability?
3. How did the terrain impact the Soviet's logistic sustainability as well as methods of delivery?
4. How did the terrain and climate impact the Soviet's equipment?

This paper will provide a background to the Soviet-Afghan War, a brief synopsis of the Afghanistan geography, organization of the Mujahideen, organization of the Soviet Army, organization of the Afghan Army, and an analysis based on the secondary research questions.

The Soviet-Afghan War

In April 1978, the Soviet Union organized a military coup d'état against the Afghanistan government that resulted in the formation of the Democratic Republic of Afghanistan (DRA) and a civil war. The Soviets attempted to impose a communist way of life on an ancient tribal-based society. The result was a people's uprising initiated by Afghan religious leaders who called for a holy war against the communist regime. The situation rapidly deteriorated and eventually led to a Soviet invasion in December of 1979. The Soviet Politburo selected the Fortieth Army for the invasion because it was

based in Turkmenistan which is Afghanistan's northern neighbor. (*Appendix A depicts a map of the region*).

The Soviet's operational concept was to seize key cities and other lines of communication and to restore the communist-backed government. The invasion lasted four days and was considered a great success. With the capital city of Kabul under the Soviet's control as well as most major cities, the DRA forces would be able to fight the Mujahideen in the rural areas. As the DRA Army began to defect and the Mujahideen's popularity grew, the Soviets were forced to engage the enemy outside of the urban areas. Nearly two months after the invasion, the Fortieth Army was engaged in an irregular war with the Mujahideen in some of the most rugged terrain on earth.

The Soviet withdrawal of Afghanistan was complete by 1989 with the collapse of 25 Soviet garrisons, 179 base camps and the retrograde of over 100,000 men.² In the end, the Soviets lost 13,833 men killed, 469,685 sick or wounded, lost 118 jets, 333 helicopters, 147 tanks, 1,314 armored personnel carriers, 433 artillery pieces, 1,138 command vehicles, 510 engineering vehicles and 11,369 trucks.³ Even more severe was that the above figures were likely underestimated. The following writing attempts to explain these harsh losses.

CHAPTER 2 – AFGHANISTAN'S GEOGRAPHY

Afghanistan is slightly smaller than Texas with a land area of 402,337.8 square miles.⁴ Its most dominate terrain feature is the Hindu Kush mountain range which literally divides the country diagonally from the northeast to the southwest. Its highest peak is in the northeast near Kabul and soars to over 24,000 feet. There are several

mountain passes along the Hindu Kush and most average 15,000 feet, with the most notable being the Khyber Pass that leads into Pakistan. (*Appendix B depicts the topography of Afghanistan*).

The Hindu Kush accounts for 60 percent of the country's land mass and naturally divides the country into three distinct regions: 1) central highlands, 2) northern plains, 3) southern plateau.⁵ As part of the central highlands, the Hindu Kush is not merely a single stretch of ridgeline. It is a series of somewhat parallel ridges that are 599 miles at its widest portion.⁶ The north-to-south length of the Hindu Kush is only 149 miles.⁷ The northern plain extends its gradual slope from the Hindu Kush northeast to the border with Uzbekistan and Tajikistan. This border is delineated by the Amu Darya River which is 2100 feet at its widest point, 1 to 15 feet deep, has a current of up to 6 feet per second, and a flood plain that extends 100 to 250 feet along both banks.⁸ The landscape near the river is lush and possesses fertile soil that is used for food crops.⁹ The southern plain accounts for about 25 percent of the country and is enclosed by the Hindu Kush and the Iranian plateau (mountains from India and Baluchistan). Its average elevation is 3,000 feet and it is characterized as a desert climate.¹⁰

The climate throughout the country varies almost as greatly as the treacherous terrain in the mountains. There are significant day-to-night temperature ranges as well as extreme seasonal temperature variations. The record low was minus 31 degrees Fahrenheit recorded in Kabul and the high was 120 degrees Fahrenheit in Jalabad.¹¹ Brian Robson described the surroundings of the 19th century soldier fighting in the second Afghan War by writing that, "Afghanistan represented heat, dust and stones, varied by piercing winds and snow. In winter men froze; in summer they died of heat

exhaustion. Like Spain, it was a country where large armies starved and small armies got beaten.^{12,,}

CHAPTER 3 – ORGANIZATION OF THE MUJAHIDEEN

There may be a rising sense of nationalism among the Afghan urbanites of modern day, but the hinterlands of the country remain centered on a tribal-based society. Great Armies have traversed and fought on Afghanistan's soil since before civilization's Common Era. These conflicts and the belligerents have made lasting impressions on the many tribes within the country. The channelizing terrain of the Hindu Kush has also enriched the tribal sense of isolation and interdependence. The rural people identify themselves by the Qawm.¹³ The Qawm is the country's sub-national identity that is founded on a decentralized family-based society. This system has ensured Afghan survival through the collapse of government and the intervention of foreign invaders.

The organization of the Mujahideen naturally mirrored that of the Qawm. Like the tribal customs, Mujahideen tactics and techniques varied from valley to valley. Unlike most insurgents, these warriors did not fight for pure political reasons or to impress a new ideology on their government. Their motives were deeply rooted in their religious beliefs and their passion to defend their tribal culture. Guerilla tactics were however a common theme throughout the Mujahideen factions. They learned to use the rugged terrain to their benefit and to operate in small groups in order to move through the mountains.

These combat groups were usually 15 to 50 men and would typically be based in a single village.¹⁴ The combat detachment was the largest group and consisted of 150 to

200 men. These detachments could be spread through multiple villages or concentrated in a single location, usually a heavily fortified position.¹⁵

Groups and detachments were supported through regional and temporary bases. The regional base would be situated in an almost inaccessible location in the mountains. These bases did possess a robust sustainment capability with services for up to 500 men. These services included training facilities, maintenance, hospitals, prisons and recreation.¹⁶ The temporary bases were much smaller and primarily located on the caravan routes leading in and out of Pakistan.¹⁷ These smaller bases consisted mostly of weapons and ammunition caches that were placed on the known Hindu Kush mountain passes.

The Mujahideen's base unit for combat was a small autonomous group that could conduct surprise night attacks and use the extreme terrain for elusive withdrawals back into the countryside. Their primary missions included:

- Sabotage lines of communications (bridges, roads, pipelines, etc)
- Emplace mines on roads
- Attack small garrisons and administrative centers
- Join other groups to form large combat formations¹⁸

The majority of these operations were conducted in the spring and summer. In the winter, most of the mountain passes were closed due to heavy snow and extreme temperatures; and the treacherous conditions of overland travel were too dangerous for even the natives.

CHAPTER 4 – ORGANIZATION OF THE SOVIET FORTIETH ARMY

The Soviet Army of the late 20th century was not only considered one of the most powerful on the planet, but it possessed more tanks and other armored vehicles than any other army known. The Soviet doctrine was predicated on heavy battle formations that were designed to give battle in Europe and across the plains of the African continent. This doctrine not only demanded open ground for maneuver, but it carried an inherently heavy logistics footprint.

The Army did possess an extremely capable airborne assault force that was combined with the appropriate escort and lift resources. The airborne brigades were similar to the motorized brigades in that they possessed infantry fighting vehicles that could be air-delivered. The Soviets also considered their highly sophisticated helicopter gunships as flying tanks. Soviet forces were designed, trained, and employed to fight peer competitors in a full scale conventional land war.

The Soviet Politburo therefore directed the establishment of a Limited Contingent of Soviet Forces (LCOSF) in Afghanistan. The LCOSF was formed from the Fortieth Army and varied from 90,000 to 120,000 men and women over the ten year war.¹⁹ It consisted of four divisions, five separate brigades, three separate regiments, and other miscellaneous subunits. It had the traditional support of aviation and logistics as well as augmentation from the KGB (Komitet Gosudarstvennoy Bezopasnosti-committee for state security) and Spetsnaz Special Forces.

The Army's major bases and stations were primarily located near major cities and communication hubs. The 1979 invasion produced a rapid build of combat troops with

the capital city of Kabul as the centerpiece. This operational focus naturally created logistic hubs and combat outposts that were near the neighboring cities. Once the Soviets occupied the country, they quickly realized that the rugged terrain would force them to depend on support bases that were outside of the mountains and near the cities and airfields.

CHAPTER 5 – ORGANIZATION OF THE DRA ARMY

The armed forces of the Democratic Republic of Afghanistan were mostly conscripted Afghans who reluctantly fell under the training and impression of their Soviet neighbor. They consisted of ground, air, air defense, and border guards whose size varied from 120,000 to 150,000.²⁰ During the 1979 Soviet invasion, the DRA's estimated strength was 40,000 of a supposed 90,000 men due to mutiny and coercion from the Mujahideen.²¹

The DRA advertised that it could field four army corps equally equipped with Soviet tanks, armored vehicles, artillery and helicopters flown by Soviet pilots. The overarching Soviet message was that the Fortieth Army was combined with its DRA brothers. For example, during sweep and block operations the DRA would sweep while the Soviets would block.²² The two identities did operate together well, and the DRA was plagued by the call from their tribal leaders to defect and resist the foreign invaders.

CHAPTER 6 – TERRAIN IMPACT ANALYSIS

Maneuver

As previously discussed, the Soviet's maneuver doctrine was founded on the employment of large armored units in open terrain. With Afghanistan being a land-locked country and its lack of navigable waterways, the Soviets were limited to air and ground maneuver. The purpose of this section is to analyze how the terrain impacted the Soviet's mobility in the motorized rifle brigades as well as the airborne brigades.

Afghanistan's cross-country mobility was and still is extremely limited. The *Department of Defense Country Handbook* estimates that more than 90 percent of the country is inaccessible by vehicle. Of the 11,000 miles of roads in the country, only 1,700 of them are paved.²³ Route One, commonly referred to as the "ring route" traces an oblong circle through the country-side and is the major feature that links the other four major roads that lead to all of Afghanistan's neighbors (*see appendix A*). Not only are most of the roads unpaved but they are very narrow especially in the mountains where they can become no wider than ten feet across.²⁴ The ring route and its feeder roads were adequate for the Soviet invasion in 1979 because all of the major cities were interconnected by the road network. That situation changed when the Soviets began to maneuver into the country-side to conduct offensive operations against the Mujahideen.

In some instances the Soviet tanks and armored vehicles were wider than mountain switchbacks and too heavy for the bridges. Local commanders were forced to make tactical decisions that significantly deviated from their military doctrine. Not only were the soldiers forced to dismount their vehicles, but they would have to leave their

vehicles behind in many cases. The mountainous terrain was the key consideration for a Mujahideen commander while establishing a defense or ambush position. Soviet commander's learned to target the key terrain surrounding an objective instead of just the objective itself. An example of this was the Panjshir River Valley operation in May of 1982. Commanding mountain heights guarded the only way in or out of the valley. The Soviets specifically targeted and secured the entrance heights and held the ground for the entire operation.²⁵ Placing dismounted infantry on the key terrain features that overlooked routes or objectives would eventually become a task for the airborne brigades, but in the interim the Soviets tested a new concept.

The Bronnegruppa, which translates to *armor group*, was an organizational and employment divergence from Soviet doctrine.²⁶ Since the armored vehicles and tanks could not traverse most of the terrain, they were grouped in formations that travelled behind the infantry. The vehicles could then provide the infantry with mobile fire support or serve as a quick reaction force. This concept proved extremely useful against the Mujahideen's mobile defense. The Bronnegruppa could place deep fires along the Mujahideen's fall-back positions and retrograde routes while Soviet helicopters literally bypassed Mujahideen strong points in search of Mujahideen who were attempting to establish new fighting positions.²⁷ This concept also enabled the Soviets to isolate the Mujahideen group from any reinforcements by another valley tribe.

The Mujahideen counter-action was to establish positional defenses instead of their typical mobile defense which relied heavily upon freedom of movement through the mountains. These positions would occasionally span from valley to valley on parallel axes.²⁸ The fruits of Soviet labor quickly rotted. The Mujahideen commanders

chose defensive positions in the most extreme terrain imaginable. Multiple fighting and firing positions were established in mountain crevices that seemed impossible to get to. Even if the Bronnegruppa vehicles could range these positions, the natural mountain cover protected the Afghani freedom fighters. Many of the fortified positions were completely isolated from any formidable road network, making it virtually impossible for the Soviets to reinforce attacks or commit a heavy quick reaction force. The Soviets would quickly learn that their only hope of out-maneuvering the Afghani's would be the skillful employment of the assault support helicopters.

The channelizing terrain and steep inclines of the country would often leave ground convoys and combat patrols in positions where supporting fires and mutual support from adjacent units was nearly impossible. The LCOSF possessed over four helicopter regiments that included a fleet of Mi-8 and Mi-6 helicopters. The Mi-6 would prove to be too large for tactical use around isolated positions due to its ability to be targeted and relative lack of agility. The Mi-8 was the preferred troop carrier but was only rated to carry twenty-four combat troops at sea level and twelve or less at altitude.²⁹ All Soviet aircraft were restricted to making cross-country flights at an altitude of 15,000 feet in order to avoid the mountains. Additionally, most landing zones would only accommodate one helicopter at a time.³⁰ The obvious implication of these limitations was a significant delay in building combat strength on an objective. The Mujahideen could either disappear into the rugged landscape or could mass on the initial airborne force.

One of the unique aspects about the Soviet airborne brigade was its possession of specialized fighting vehicles that could be air delivered. Soviet procedures called for

these vehicles to be dropped near a staging area in order to organize the force. The airborne soldiers would then drive their vehicles to the objective. The mountains not only lacked adequate landing zones, but depending on the area, the nearest vehicle staging area may be distant from the objective area. The airborne brigades were forced to operate either without vehicles or to link up with the vehicles at a great distance from the objective area, thus negating the positive aspects of conducting an air assault with vehicles.

Soviet commanders grew accustomed to developing innovative plans that mitigated the enemy's use of the terrain. But tactical decisions were only lightly influenced by the Soviet's equipment and technology. The organization, movement, and employment of Soviet ground and air force were dictated by the terrain. The ground had the initial and final tactical say.

Weaponry

The Soviet's arsenal of weapons showcased an impressive display of systems that were available in the 1980's, and in most cases the weapons themselves performed well in the Afghanistan environment. The employment of these weapons on the other hand was the primary beneficiary from the effects of terrain. The purpose of this section is to analyze how the terrain impacted the Soviet's employment of their organic weapon systems. Both direct and indirect weapons systems will be analyzed as well as ground and air platforms.

In laymen's terminology the Soviet's employment of both mortars and artillery can be described in two broad categories or methods. The first method was the

traditional employment of the weapon system by establishing target reference points as well as a refined target location. In this method, only the forward observer could see the target. The second method of employment was the direct fire mode where both the gun team and the forward observer could typically observe the target. Artillery fired in the direct fire mode displayed a fairly flat trajectory of fire as opposed to a normal high angle trajectory. Both methods proved to be extremely difficult in a mountainous environment.

The Soviets typically attempted direct fire missions when the enemy had constructed fighting positions high on facing mountainsides.³¹ In many cases, these fire missions were conducted in remote areas where the Soviet troops were isolated from their vehicles and heavy artillery. Most combat patrols in the mountains were mutually supported by an adjacent patrol which was equipped with an 82 mm tray (*podnos*) mortar.³² The *podnos* mortar was lighter than the vehicle mounted mortar and could be man-packed into the mountains. Soviet patrols learned to rely on the weapons that they could carry. Due to the terrain and elevation, many combat patrols could not effectively utilize traditional artillery or close air support. Although the *podnos* mortar was technically man-portable, it weighed almost 100 pounds and its ammunition was equally as heavy. Furthermore, the hardened terrain and deep crevices of the mountains proved to be a formidable defense against artillery smaller than 82mm, and the soldiers were forced to trade mobility for effective fire support.

Artillery that was fired at a high trajectory was more effective in the Hindu Kush Mountains. But the downside was that high trajectory fire required more accurate calculations by the forward observers and the gun crews. The doctrinal

employment of Soviet artillery units was based on moderate terrain and the use of all enabling assets such as meteorological data systems. In Afghanistan, these meteorological data stations were located in places that displayed inaccurate readings for the location of the artillery systems.³³ Even when the stations were positioned near the gun lines, the change in elevation, temperature and winds would produce incorrect data for the firing lines. In an attempt to solve this problem, the Soviets conducted a regional meteorological survey.³⁴ Although a prudent concept, the data's shelf life was limited due to the ever-changing climate in the region.

Additionally, fire adjustments to artillery missions became an art for the most experienced forward observers. The Mujahideen skillfully constructed their mountain defense with the capabilities of the Soviet artillery in mind. Individual positions were built on narrow ledges and on the reverse slopes of military crests. Soviet forward observers would often be unable to observe the impact of the rounds because minor lateral adjustments would often place the round over the ledge of a plateau, and thus place the round several hundred feet lower than the intended target.

The mountain valleys and peaks also degraded the capabilities of the Soviet vehicle mounted direct fire weapon systems. The Mujahideen would emplace ambushes on the high ground that overlooked known Soviet supply and patrol routes. The majority of the main battle guns on armored vehicles and tanks could not elevate past 60 degrees.³⁵ This posed a significant planning problem for the Soviet convoy commanders. Since the convoys knew that they could not achieve fire superiority if attacked from imposing heights, the convoy commanders attempted to predict where the Mujahideen would establish an ambush. Although this is an intuitive process to a combat commander, the

Soviets were forced to take the next step by placing troops on ridgelines and by holding the ground until the convoy made a successful pass. A simple concept, but the terrain often dictated an unsupportable amount of missions or the preferred site may have been completely inaccessible to ground troops. A possible solution was to air lift patrols onto these heights and it did not take long for the Soviets to incorporate assault support into most of their combat operations.

Long before the introduction of the U.S. supplied stinger missiles, the Mujahideen possessed Strella-2 missiles as well as DShk heavy machine guns that served as effective air defense systems.³⁶ Soviet helicopter pilots quickly transitioned from flying nap-of-the-earth to 4,500 feet above ground level.³⁷ Depending on the ground elevation, the aircraft could be flying at altitudes that exceeded 10,000 feet above sea level. At this elevation, the flying performance as well as the helicopter's weapon systems was greatly reduced.³⁸ The Soviet reaction was to change their close air support doctrine and to reduce the weight of the helicopters.

To make a transport helicopter weigh less one simply reduces the number of soldiers who ride. The unfortunate effects are the obvious loss in combat power that can be inserted. To lighten an attack helicopter is a bit more difficult. The Soviets not only reduced the amount of ordnance and fuel of the helicopters, but they stripped the fuselages of the crew armor.³⁹ Without underbelly armor, the pilots and crew members were susceptible to Mujahideen small arms attacks. The helicopter units were forced to modify the conduct of close air support.

Soviet helicopter pilots started a concept that they called forming a circle.⁴⁰ Multiple helicopters would form a flying circle at an altitude outside of the enemy air defense systems. One helicopter would then conduct a dive bomb mission at a low altitude while the remaining helicopters suppressed the air defense threats. Although this concept seemed to increase the survivability of the helicopter crews, the impact on the ground forces left much to be desired. Ground forward air controllers had difficulty in observing and controlling helicopters on steep dives and at high speeds. Additionally, the helicopters conducted rocket and gun runs at high speeds and the surface danger zones to the friendly ground forces grew exponentially.

Most complex weapon systems rely heavily upon moderate environmental conditions that should be within the equipment manufacturer's recommended operating boundaries. The terrain and climate of Afghanistan routinely exceeded those boundaries. Additionally, the accuracy of indirect fire weapon systems is based largely on target location and a unit's ability to observe rounds while making corrections. Both aviation assets and modern day armored fighting vehicles show obvious limitations due to elevation and climate. The mountainous region of Afghanistan is a surplus of such harsh conditions and it tested the Soviet's weapons as well as the soldiers' ability to employ them.

Logistics

Soviet logistics took an interesting twist as the Mujahideen began to effectively destabilize the Afghan government. Not only were Soviet planners and logisticians burdened with sustaining its force in a foreign country, but the sustainment of the DRA

Army surely rested on the shoulders of the Soviet support system.⁴¹ Most of the Fortieth Army's supplies originated from Russia and then travelled through a country with no waterways, railroad system, and a very limited road network. All major logistics hubs were built around cities that had access to the only paved road in the country (Hwy 1-ring route). Once the Fortieth Army began its operations throughout the countryside, the logistics problem became severe. The purpose of this section is to analyze how the terrain impacted Soviet logistics in regards to methods of sustainment and the use of general engineering assets for mobility.

Soviet outposts were typically sustained by ground convoy or aerial resupply. Not only was it dangerous to travel in ground convoys through terrain that favors the ambush, the harsh ground took its toll on the combat readiness of the Soviet vehicles. Additionally, the material depots were located on large bases that possessed airfields.⁴² As the Soviets attacked the Mujahideen deeper into the countryside they became equally distant from their sustainment bases. This greater distance when combined with the enemy's skillful use of the terrain led the Soviets to concentrate on the aerial re-supply method. Although using helicopters to resupply ground troops can be extremely responsive as well as provide better force protection, it is a concept that is difficult to sustain during major combat operations. The Soviet operations in the Panjshir Valley in 1982 were a classic example of resource limitations and an unsustainable operating tempo for the helicopter crews. During the operations, the Soviets needed to transport all supply items from Bagram Airbase to a predetermined landing zone in the Panjshir Valley. Over three days, helicopter crews flew 180 tons of ammunition and 30 tons of food supplies.⁴³ Impressive numbers, however the toll taken on the pilots who averaged

seven missions per day made a significant impact on the responsiveness of the squadrons. The pilots and their equipment could surge for specific operations, but long term sustainment demanded the use of both aerial and ground resupply.

Another common practice for sustaining isolated combat outposts was to sling load supply pallets and drop them directly into the patrol base. The terrain and enemy mandated that the Soviet helicopters drop their loads from 15 to 100 feet and while travelling from 10 to 40 mph.⁴⁴ Supply pallets were usually packed with sand or rags and in some instances were equipped with shock absorbers in an effort to protect the cargo from impact.⁴⁵ Delivering supplies in this fashion was not only a risky endeavor but limited the type and amount of provided goods. Ground convoys were still needed to supply fuel and other volatile items such as explosive ammunitions and mines. Although fuel was not necessarily an emergency item to outposts high in the mountains, a lack of indirect fire ammunition could prove detrimental when attempting to dislodge the enemy from fortified positions. The mountainous outposts relied on convoys to deliver mortar rounds to the lower bases and then the soldiers would carry the ammunition to the higher outposts. The proverbial Soviet logistics tail was not only long, but it almost always depended on ground transportation at some point in the process.

An interesting solution to providing fuel for some of the lower lying Soviet outposts was the tactical pipeline. Pipeline construction brigades were formed with the purpose of piping fuel and other lubricants. These units had the capacity to construct two parallel pipelines from the Soviets rear area to the forward edge of the battle space.⁴⁶ This concept only worked in a contiguous battle space with an ever increasing rear area during offensive operations. Not surprisingly, the Mujahideen

attacked these pipelines and forced the Soviets into a zero sum game by having to provide additional troops to guard the pipelines. The end result was to rely again on the use of ground convoys that travelled dangerous terrain.

To keep the major supply routes open, the Soviets relied heavily upon their combat support engineering assets. The majority of all consumable supply items were flown from Russia to either Kandahar or Bagram airbases where it was distributed throughout the Soviet battle space. But some of the major end items such as replacement helicopters and other specialized equipment were still trucked in from Temez on Highway One through the Salang tunnel. Highway One was and is the only direct ground route from Russia to Kabul. Additionally, there were more than 900 bridges along Afghanistan's road networks and the Mujahideen actively destroyed many of them.⁴⁷ The unnatural roadside threats from the Mujahideen were often combined with natural obstacles from the environment. In the winter, highway travelers contended with large snow drifts, avalanches and swollen river banks.

The Soviets employed engineer road brigades that could be organized for road clearing and/or river crossing.⁴⁸ Individual road companies possessed five bridge laying vehicles as well as miscellaneous construction vehicles.⁴⁹ Bridge laying machines were not large enough for rivers like the Amu Darya, and the smaller bridges in the interior typically called for all five of the bridging assets within the company. One of the key challenges to the Soviet engineers was how to recover the bridging assets once the convoy had safely passed the effected area. The narrow width of the mountain roads and the steep switchbacks made it nearly impossible for vehicles to pass one another on certain sections of the roadways.

The Mujahideen would often destroy a bridge or stretch of road on a narrow pass which would impede the progress of the Soviet road companies. The movement of the road clearing units could be likened to the movement of an inchworm, and when an obstacle was presented on a single lane road with no bypass the results could be catastrophic. The Soviet reaction was to employ utility helicopters that could lift the engineering vehicles down a stretch of highway as they were needed. The obvious implication was the adverse effect on tempo, but the second order consequence was that many of the helicopters that were used were also allocated for offensive combat or resupply.

The Soviet's logistics system was plagued by a cause and effect cycle that was generated by the difficult terrain. Logisticians were limited to supply goods by tactical convoy or by helicopter. The terrain presented serious challenges for both sustainment methods, and initiatives like the tactical pipeline system were quickly crippled by enemy attacks. Additionally, ground convoys in the mountains were limited not only by the terrain and weather but by the capabilities of their engineering assets. It was not difficult for the Mujahideen to effectively block the only road that leads in or out of a valley. It was however extremely difficult for the Soviets to bypass or break through these obstacles. Once again, the terrain tipped the scales in favor of the Mujahideen.

Equipment

A simple metric to obtain would be how the Soviet's equipment was degraded by the environmental conditions in Afghanistan. In a country with an extreme climate and topographical relief, it would not be surprising to learn that helicopters and other complex

weapons systems did not operate at optimal capacity. The purpose of this section is to analyze how the terrain impacted the Soviet's equipment in regards to engineering assets, target acquisition systems, and helicopters.

Both Soviet armored vehicles and engineering vehicles were designed for employment on the European or African continent. The earthmoving machines were employed with the engineering road companies and could travel at speeds that were comparable to most Soviet tanks. Additionally, the average weight of both wheeled and tracked earth moving machines was 25 metric tons.⁵⁰ The significant weight and high speed of these machines was not the employment issue in Afghanistan. The 45th Engineer Regiment possessed four types of earth moving vehicles that ranged from light to heavy earth moving capacity. The rocky ground and compacted dirt challenged even the largest of these machines. These machines could operate very well on the fertile plains of Europe or the sand hills of the African Sahara. But the scorched surface of the Afghanistan plains and the boulder-laden areas caused the earthmoving machines to make little progress and endure more frequent maintenance. Additionally, the rarified air at higher elevations greatly reduced the efficiency of the machine's gasoline engines.

The impacts of high altitude and terrain also affected targeting systems in a uniquely scientific way. The Soviet's artillery reconnaissance systems located enemy positions by using sound ranging, radar, and various optical methods.⁵¹ Their primary systems relied on both sound and radar. These systems were specifically designed to detect high caliber munitions that were employed over great distances and in a relatively open area. The Mujahideen used smaller artillery that ranged from 50mm to 107mm and employed them deep within the mountainside where the muzzle blast was muffled by the

terrain.⁵² Both sound and radar systems were virtually ineffective in this type of environment.

Soldiers also experienced difficulty in range estimation in the mountains. Not only were the mountain heights deceiving to the naked eye, but the accuracy of the laser range finders was greatly reduced at extreme elevations where solar radiation levels were higher.⁵³ The Soviets quickly realized that they must depend on the old fashion methods of target acquisition and range estimation. The foundation to optical reconnaissance is the use of maps, compasses and binoculars. The nonlinear terrain of Afghanistan significantly reduced the Soviet's high-tech systems for fire direction and control.

Another challenge to the Soviet forward observers was the lack of geodesic survey points and prominent terrain in the country.⁵⁴ In order to quickly place indirect fires on an enemy position, the Soviets not only had to register the target but they also needed several registered target reference points in order to make accurate adjustments. The fact that most company grade officers as well as non-commissioned officers did not possess maps only added to the problems that the harsh terrain presented.⁵⁵

On a larger planning scale, the helicopter lift and on station times were seriously effected in both the mountains and the southern plateau region. The average elevation at the airfields outside of the mountains was between 3,000 and 5,000 feet above sea-level.⁵⁶ Both the Mi-8 and Mi-6 helicopters were very powerful platforms, but their ceiling heights were limited to around 14,000 feet above sea level with optimal external conditions.⁵⁷ The average mountain height in the Kabul area was between 9,000 and

12,000 feet above sea level, and depending on the location of the enemy air defense, the Soviet pilots may be forced to fly at the aircraft's maximum operating altitude. Additionally, transport helicopters were typically rated to carry ten combat troops, but at higher altitudes and under extreme weather patterns, the performance and lift capacity of the helicopters was significantly reduced. Soviet planners divided landing zones into four categories that were distinguished by elevation. Category I landing zones were considered 4,500 feet and helicopters could carry up to eight soldiers, while category IV landing zones were considered over 6,000 feet and helicopters could only carry four soldiers.⁵⁸

The Soviets were forced to make significant modifications to how they employed their equipment in such an extreme environment. In most cases they did not attempt to modify pre-existing equipment in order to operate in the environment. They either used the equipment in a degraded manner or they developed alternate methods to accomplish the mission. The Soviets learned the hard way that equipment that is dependent on technology or fair conditions for optimal performance does not operate well in a mountainous environment.

CHAPTER 7 – CONCLUSION

In the end, the Fortieth Army was unable to defeat an enemy who understood how to fight in a mountainous environment. Although there are certainly other factors which pushed the Soviet Union to withdraw from Afghanistan, the key enabling factor was the terrain.

By 1986, the Soviets had learned bloody lessons while attempting to maneuver conventional ground forces through channelized terrain with limited maneuver space. The overwhelming Soviet reaction was to focus primarily on aviation in order to maneuver combat units and provide sustainment. Six years into the war, the Soviets withdrew the tank and air defense regiments and increased the number of helicopters from 60 to 300.⁵⁹ The overreliance on the use of helicopters resulted in the operating tempo being limited by aircraft availability and maintenance, and by the combat loss of over 300 helicopters. Soviet planners probably anticipated that their aviation assets would be limited in the mountains, but it is doubtful whether or not they realized the impact that the terrain would have on all of their supporting arms systems.

Quite a few studies have been made on the reasons or the one catalyst for the Soviet's withdrawal from Afghanistan. This paper contends that the Mujahideen resistance was firmly grounded on their ability to use the rugged terrain. The author therefore poses the following question; would the Soviets have defeated the Mujahideen in a place with an identical social, political and economical atmosphere, but with the geography of Kansas? This author contends that they would.

¹ Brian Robson, The Road to Kabul, The Second Afghan War, 1878-1881, (1986), 18.

² Lester W. Grau, and Michael A. Gress, The Soviet-Afghan War: How a Superpower Fought and Lost, (Russia Federation, 2002), 147.

³ Lester W. Grau (Ed.), The Bear Went Over the Mountain: Soviet combat tactics in Afghanistan, (Washington, D.C.: National Defense University Press 1996), xix.

⁴ Department of Defense, Afghanistan Country Handbook, (2003), 5.

-
- ⁵ Robson, The Road to Kabul, The Second Afghan War, 1878-1881, 16.
- ⁶ Department of Defense, Afghanistan Country Handbook, 5.
- ⁷ Ibid, 5.
- ⁸ Lester W. Grau, & Michael A. Gress, The Soviet-Afghan War: How a Superpower Fought and Lost, 246.
- ⁹ Robson, The Road to Kabul, The Second Afghan War, 1878-1881, 16.
- ¹⁰ Ibid, 16.
- ¹¹ Department of Defense, Afghanistan Country Handbook, 5.
- ¹² Robson, The Road to Kabul, The Second Afghan War, 1878-1881, 18.
- ¹³ Ali Ahmad Jalali, & Lester W. Grau, The Other Side of the Mountain: Mujahideen Tactics in the Soviet-Afghan War, (Foreign Military Studies Office, Fort Leavenworth, Kansas, 1995), xiii.
- ¹⁴ Lester W. Grau, & Michael A. Gress, The Soviet-Afghan War: How a Superpower Fought and Lost, 58.
- ¹⁵ Ibid, 58.
- ¹⁶ Ibid, 60.
- ¹⁷ Ibid, 60.
- ¹⁸ Ibid, 58.
- ¹⁹ Lester W. Grau, & Michael A. Gress, The Soviet-Afghan War: How a Superpower Fought and Lost, xix.
- ²⁰ Ibid, 48.
- ²¹ Mark Galeotti, Afghanistan, the Soviet Union's Last War, (Frank Cass and Co., Great Britain, 1995), 7.
- ²² Lester W. Grau, & Michael A. Gress, The Soviet-Afghan War: How a Superpower Fought and Lost, 51.
- ²³ Department of Defense, Afghanistan Country Handbook, 22.
- ²⁴ Lester W. Grau, & Michael A. Gress, The Soviet-Afghan War: How a Superpower Fought and Lost, 3.

²⁵ Ibid, 74.

²⁶ Andrei A. Doohovskoy, Soviet Counterinsurgency in the Soviet Afghan War Revisited: analyzing the effective aspects of the counterinsurgency effort, (2009), 92.

²⁷ Lester W. Grau, & Michael A. Gress, The Soviet-Afghan War: How a Superpower Fought and Lost, 81.

²⁸ Ibid, 82.

²⁹ Ibid, 201.

³⁰ Ibid, 208.

³¹ Ibid, 173.

³² Ibid, 167.

³³ Ibid, 184.

³⁴ Ibid, 184.

³⁵ Andrew W. Hull, David R. Markov, Steven J. Zaloga, Soviet/Russian armor and artillery design practices: 1945 to present, (1999), 285.

Lester W. Grau, & Michael A. Gress, The Soviet-Afghan War: How a Superpower Fought and Lost, 212.

³⁷ Ibid, 211.

³⁸ Ibid, 214.

³⁹ Ibid, 217.

⁴⁰ Ibid, 214.

⁴¹ Ibid, 139.

⁴² Ibid, 83.

⁴³ Ibid, 83.

⁴⁴ Ibid, 287.

⁴⁵ Ibid, 287.

-
- ⁴⁶ Threats Division, Concepts and Force Design Directorate, Soviet Logistics 1977, (Fort Leavenworth, Kansas, 1977), 8-4.
- ⁴⁷ Lester W. Grau, & Michael A. Gress, The Soviet-Afghan War: How a Superpower Fought and Lost, 243.
- ⁴⁸ Ibid, 253.
- ⁴⁹ Ibid, 248.
- ⁵⁰ Ibid, 251.
- ⁵¹ Ibid, 170.
- ⁵² Ibid, 170.
- ⁵³ Ibid, 171.
- ⁵⁴ Ibid, 184.
- ⁵⁵ Stephen J. Blank, Operational and Strategic Lessons of the War in Afghanistan, 1979-90, (1991)72.
- ⁵⁶ Lester W. Grau, & Michael A. Gress, The Soviet-Afghan War: How a Superpower Fought and Lost, 211.
- ⁵⁷ Bill Sweetman, Soviet Military Aircraft, (1981), 126-130.
- ⁵⁸ Lester W. Grau, & Michael A. Gress, The Soviet-Afghan War: How a Superpower Fought and Lost, 78.
- ⁵⁹ Blank, Operational and Strategic Lessons of the War in Afghanistan, 1979-90, 73.

BIBLIOGRAPHY

Bauman, Robert F., Russian-Soviet Unconventional Wars in the Caucasus, Central Asia, and Afghanistan, 1993.

Blank, Stephen J., Operational and Strategic Lessons of the War in Afghanistan, 1979-90, 1991.

Coll, Steve, Ghost Wars: The Secret History of the CIA, Afghanistan, and Bin Laden, From the Soviet Invasion to September 10, 2001, Penguin Books, 2004.

Department of Defense, Afghanistan country handbook, 2003.

Doohevskoy, Andrei A., Soviet Counterinsurgency in the Soviet Afghan War Revisited: analyzing the effective aspects of the counterinsurgency effort, 2009.

Galeotti, Mark, Afghanistan, the Soviet Union's Last War, Frank Cass and Co., Great Britain, 1995.

Grau, Lester W. (ed.), The Bear Went Over the Mountain: Soviet combat tactics in Afghanistan, Washington, D.C.: National Defense University Press, 1996.

Grau, Lester W., Breaking Contact without Leaving Chaos: The Soviet withdrawal from Afghanistan, Journal of Slavic Military Studies, 20(2), 2007.

Grau, Lester W. and Gress, Michael A., The Soviet-Afghan War: How a Superpower Fought and Lost, Russian Federation, 2002.

Hull, Andrew W., Markov, David R., Zaloga, Steven J., Soviet/Russian armor and artillery design practices: 1945 to present, 1999.

Jalali, Ali, Ahmad, & Grau, Lester W., The Other Side of the Mountain: Mujahideen Tactics in the Soviet-Afghan War, Foreign Military Studies Office, Fort Leavenworth, Kansas, 1995.

Robson, Brian, The Road to Kabul, The Second Afghan War, 1878-1881, 1986.

Sweetman, Bill, Soviet military aircraft, 1981.

Threats Division, Concepts and Force Design Directorate, Soviet Logistics 1977 Fort Leavenworth, Kansas, 1977.

APPENDIX A

